

CLAIMS

What is claimed is:

1. A valve apparatus for medical applications, comprising a first flexible member extending across a first lumen through which a flow of materials is to be controlled, the first flexible member including a plurality of first movable elements formed on opposite sides of at least one first slit extending through the first flexible member, the first moveable members being biased so that, when a pressure less than a predetermined threshold value is applied to the first flexible member, the first moveable elements are maintained in a closed position in which no flow is permitted past the first flexible member and, when a pressure at least as great as the threshold value is applied to the first flexible member, the first moveable elements are moved to an open position separated from one another along the at least one first slit permitting flow through the first lumen.
2. The valve apparatus according to claim 1, wherein the first movable elements are biased toward the closed position by the resilience of the material of the first flexible member.
3. The valve apparatus according to claim 2, wherein the at least one first slit is substantially linear.
4. The valve apparatus according to claim 3, wherein the substantially linear first slit is substantially parallel to a major axis of the first flexible member.
5. The valve apparatus according to claim 1, further comprising a first housing coupled to a catheter which, when in an operative position, extends into a patient's

body to facilitate fluid exchange, the first housing being selectively coupleable to a first external line for fluid transfer between the patient and external devices, wherein the first lumen extends through the first housing.

6. The valve apparatus according to claim 5, wherein the first housing further comprises a second lumen and wherein a second flexible member extends across the second lumen, the second flexible member including a plurality of second movable elements formed on opposite sides of at least one first slit extending through the second flexible member, the second moveable members being biased so that, when a pressure less than a predetermined threshold value is applied to the second flexible member, the second moveable elements are maintained in a closed position in which no flow is permitted past the second flexible member and, when a pressure at least as great as the threshold value is applied to the second flexible member, the second moveable elements are moved to an open position separated from one another along the at least one second slit permitting flow through the second lumen.

7. The valve apparatus according to claim 5, further comprising a second housing coupled to the catheter, wherein the first housing is coupled to a first lumen of the catheter and the second housing is coupled to a second lumen of the catheter, the second housing being selectively coupleable to a second external line for fluid transfer between the patient and external devices, and wherein the second housing further comprises a second flexible member extending across the second lumen, the second flexible member including a plurality of second movable elements formed on opposite sides of at least one first slit extending through the second flexible member, the second moveable members being biased so that, when a pressure less than a predetermined threshold value is applied to the second flexible member, the second moveable elements are maintained in a closed position in which no flow is permitted past the second flexible member and, when a pressure at least as great as the threshold value is applied to the second flexible member, the second moveable elements are moved to

an open position separated from one another along the at least one second slit permitting flow through the second lumen.

8. The valve apparatus according to claim 3, wherein the first flexible member further includes a pair of second slits, each of the second slits intersecting a corresponding end of the first slit.

9. The valve apparatus according to claim 5, wherein the first housing is integrally formed with the catheter.

10. The valve apparatus according to claim 5, wherein the catheter includes a tissue penetrating distal end for insertion into a lumen of a vascular organ of the patient and wherein the first flexible member is constructed so that naturally occurring pressures applied thereto by the patient's vascular system are below the threshold value and a pressure applied to the first flexible member by an external pump is above the threshold value.

11. The valve apparatus according to claim 1, wherein the catheter is a dialysis catheter and wherein the threshold value is set so that movable elements move to the open position in response to pressure generated by a dialysis pump connected to the first housing.

12. The valve apparatus according to claim 1, further comprising at least one biasing member coupled to the first flexible member substantially parallel to the first slit to increase the biasing force urging the first moveable elements toward the closed position.

13. The valve apparatus according to claim 1, wherein the first flexible member is formed of silicone.

14. The valve apparatus according to claim 1, wherein the first flexible member is permanently sealed around an entire perimeter of the first lumen.

15. A dialysis connector comprising:

a valve housing having a first end connectable to a patient line and a second end mounted to a dialysis line;

a flow passage of the housing being connected to the patient line and being operatively connectable to the dialysis line;

a valve element mounted within the flow passage of the housing, the valve element including a flexible member extending across the flow passage, the flexible member including a plurality of movable elements formed on opposite sides of a first slit extending through the flexible member, the moveable members being biased so that, when a pressure less than a predetermined threshold value is applied to the flexible member, the moveable elements are maintained in a closed position in which no flow is permitted past the flexible member and, when a pressure at least as great as the threshold value is applied to the flexible member, the moveable elements are moved to an open position separated from one another along the first slit permitting flow through the flow passage.

16. The connector according to claim 16, wherein the valve element comprises a flexible disk disposed in the flow passage.

17. The connector according to claim 16, wherein the first slit is substantially linear and is disposed substantially centrally on the flexible member.

18. The connector according to claim 18, further comprising a second slits disposed at end points of the first slit.

19. The connector according to claim 18, wherein the second slits are substantially perpendicular to the linear slit.
20. The connector according to claim 18, wherein each of the second slits extends at an angle to the first slit.
21. The connector according to claim 16, wherein the first slit comprises a pair of substantially parallel linear slits.
22. The connector according to claim 16, wherein the first slit is curved.
23. The connector according to claim 18, wherein the movable elements are unconstrained along the first slit.
24. The connector according to claim 16, further comprising biasing elements coupled to the flexible member to urge the moveable elements toward the closed position.
25. The connector according to claim 16, wherein a size and configuration of the first slit is selected to provide desired opening and closing characteristics of the moveable members.
26. A flow shutoff device for medical applications, comprising:
 - a housing attachable to a patient line; and
 - a pressure actuated valve mounted within the housing to selectively restrict flow therethrough, movable elements of the valve being biased toward a closed position and being movable to an open position when a pressure applied to the valve exceeds a predetermined threshold value, wherein flow through the housing is prevented when the movable elements are in the closed position.

27. The device according to claim 27, wherein the valve comprises a flexible member including a plurality of movable elements separated by a slit extending through the flexible member.